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Persistence of gaps in Annual Sorghum following burning of fallen trees

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A previous report in the *Northern Territory Naturalist* (Andersen *et al.* 2008) described a noteworthy interaction between fallen trees, fire and Annual Sorghum (*Sarga* sp.) following a freak tornado in March 2007 that deforested approximately 3 km^2 of savanna woodland in Kakadu National Park. During the following wet season there were numerous gaps in Annual Sorghum cover associated with the burning of fallen trees during the 2007 dry season. Some of these gaps were linear and associated with burnt tree trunks, whereas others were far more extensive and associated with the burning of canopy branches. The sorghum gaps were attributed to local mortality of the seed bank due to lethal subsurface soil temperatures caused by long fire residence times, possibly associated with smouldering combustion. Many of the sorghum gaps were almost completely bare, indicating that other herbaceous species were similarly affected by high fire residence times.

At the time, it was unclear how persistent these sorghum gaps might be, nor what their long-term implications for vegetation dynamics would be. It was noted that there would be a persistent legacy if the absence of Annual Sorghum allowed the establishment or expansion of other species that then limited sorghum recolonisation.

A return visit to the site in May 2010, three years after the tornado and subsequent burning of fallen trees, revealed the sorghum gaps to be remarkably persistent. There was no evidence of sorghum recolonisation of either linear (Figure 1A) or more extensive gaps (Figures 1B, C). In most cases the gaps were still almost totally bare, without recolonisation by any grass-layer species (Figures 1A, B). There can be little doubt that seeds of a variety of species would have dispersed into the gaps over this time. Persistence of bare areas indicates that burning of fallen trees created physical or chemical conditions that are not suitable for germination or seedling growth and survival in the longer term. One sorghum gap was noteworthy in that it contained an unusually high density of acacia seedlings (Figure 1C). This will very possibly lead to the establishment of a localised acacia thicket.

These observations indicate that the burning of fallen trees might have significant long-term implications for small-scale patch dynamics. It is still unclear what these implications might be for the majority of sorghum gaps, where there is no evidence of any recolonisation more than two years after their establishment. However, the unusually high density of acacia seedlings in one gap points to the potential for major vegetation transformation within these patches. It is also unclear if such gap dynamics routinely occur following tree fall in Top End savannas, or are peculiar to the circumstances occurring at the tornado site.

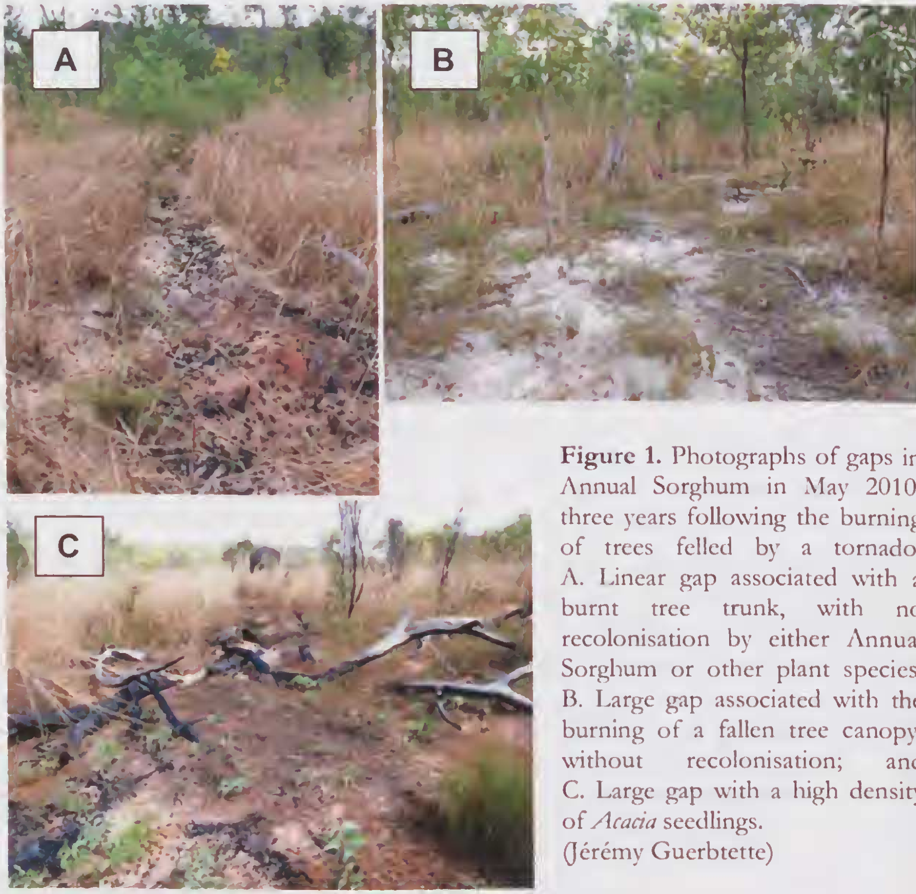

Figure 1. Photographs of gaps in Annual Sorghum in May 2010, three years following the burning of trees felled by a tornado: A. Linear gap associated with a burnt tree trunk, with no recolonisation by either Annual Sorghum or other plant species; B. Large gap associated with the burning of a fallen tree canopy, without recolonisation; and C. Large gap with a high density of *Acacia* seedlings. (Jérémy Guerbtette)

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Reference

Andersen A.N., Bradley M., Cook G.D., Eager R., Lawes M., Richards A. and Schatz J. (2008). Burning following tree fall causes local elimination of annual sorghum. *Northern Territory Naturalist* 20, 41-46.